HIV Prevalence, Risk Behaviors, Health Care Use, and Mental Health Status of Transgender Persons: Implications for Public Health Intervention

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ABSTRACT

Objectives. This study described HIV prevalence, risk behaviors, health care use, and mental health status of male-to-female and female-to-male transgender persons and determined factors associated with HIV.

Methods. We recruited transgender persons through targeted sampling, respondent-driven sampling, and agency referrals; 392 male-to-female and 123 female-to-male transgender persons were interviewed and tested for HIV.

Results. HIV prevalence among male-to-female transgender persons was 35%. African American race (adjusted odds ratio [OR]=5.81; 95% confidence interval [CI]=2.82, 11.96), a history of injection drug use (OR=2.69; 95% CI=1.56, 4.62), multiple sex partners (adjusted OR=2.64; 95% CI=1.50, 4.62), and low education (adjusted OR=2.08; 95% CI=1.17, 3.68) were independently associated with HIV. Among female-to-male transgender persons, HIV prevalence (2%) and risk behaviors were much lower. Most male-to-female (78%) and female-to-male (83%) transgender persons had seen a medical provider in the past 6 months. Sixty-two percent of the male-to-female and 55% of the female-to-male transgender persons were depressed; 32% of each population had attempted suicide.

Conclusions. High HIV prevalence suggests an urgent need for risk reduction interventions for male-to-female transgender persons. Recent contact with medical providers was observed, suggesting that medical providers could provide an important link to needed prevention, health, and social services. (*Am J Public Health.* 2001;91:915–921)

Transgender is a term used to describe individuals who have a persistent and distressing discomfort with their assigned gender.[1] Such individuals were born anatomically as one biological sex but live their lives to varying degrees as the opposite sex. Qualitative research suggests that male-to-female and female-to-male transgender individuals experience severe employment, housing, and health care discrimination, and many engage in behaviors that put them at risk for HIV.[2–6]

High HIV prevalence has been found in small published studies of male-to-female sex workers recruited from street locations in Atlanta, Ga[7] (68%), and Tel Aviv, Israel[8] (11%); a drug treatment center in Rome, Italy[9] (46%); and a clinic in Italy[10] (57%). In addition, research comparing male-to-female sex workers with male and female sex workers in the same neighborhoods has consistently found higher HIV prevalence in transgender samples.[7,8,11–14]

Male-to-female transgender persons not currently involved in sex work were included in 4 published studies that sampled in clinics, communities, and prison systems.[15–19] HIV prevalence was lower than in studies of male-to-female sex workers, but sexual and injection drug risk behaviors were common.[15–17] Two of these studies compared male-to-female transgender persons with males, females recruited in the same settings, or both, and found a higher prevalence of risk behaviors among male-to-female transgender persons.[18,19]

Studies of male-to-female transgender individuals have relied on small convenience samples and predominantly have reported data on individuals seeking HIV testing or self-reporting HIV seropositivity.[9,10,15–19] Three studies included street-based sampling methods but lacked power to determine independent predictors of HIV infection.[7,8,17] No studies have quantitatively assessed HIV risk among female-to-male transgender individuals. To address these limitations, we conducted interviews and HIV testing with 392 male-to-female and 123 female-to-male transgender persons in San Francisco, Calif. We describe HIV prevalence and risk behaviors among male-to-female and female-to-male individuals and assess the independent predictors of HIV infection among male-to-female transgender individuals. We also report on health care use and mental health status of both populations.

Methods

Subjects and Recruitment

Our targeted sampling plan[20] was based on information gathered from focus groups with 100 transgender persons,[6] 30 key informant interviews, and social mapping in neighborhoods thought to have high concentrations of transgender persons. We used participatory research strategies whereby members of the target population were involved in development, implementation, and interpretation of the study.[21,22]

Three male-to-female transgender individuals (African American, Filipina, and Latina) and 3 female-to-male transgender persons (1 Vietnamese and 2 White) were hired as interviewers. Staff received 35 training sessions, including HIV counseling, interview-

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ing, confidentiality, harm reduction, street outreach, suicide prevention, and referrals. From July through December 1997, staff recruited individuals from street settings, bars, and social gatherings catering to transgender persons, and agencies referred clients to the study. We also initiated respondent-driven sampling[23]; each study participant received an incentive for eligible persons recruited.

Recruited individuals called a toll-free number and were screened for eligibility. Individuals were eligible if they (1) were 18 years or older; (2) lived, worked, or socialized in San Francisco; (3) spoke English, Spanish, Vietnamese, or Tagalog; and (4) stated that their primary gender was transgender, transsexual, bigender, transvestite, cross-dresser, intersexed, or the opposite sex of that at birth.

Eligible subjects were scheduled for an interview at 1 of 8 community-based organizations and could request the gender or race/ethnicity of their interviewer. Interviewers identified and prevented 3 participants from reenrolling. A composite variable of unique personal identifiers also was created; no duplicates were identified with this variable.

Written informed consent was obtained before interviewing and HIV testing. Two weeks later, participants received HIV test results and further counseling and referrals from the same interviewer. Missed follow-up appointments could be rescheduled, but staff did not try to locate participants who missed appointments. Participants received $40 for the interview, $10 for the follow-up appointment, and $5 for up to 5 eligible persons they referred.

Instrument and Measures

Sociodemographic measures included race/ethnicity, age, sexual orientation, education, incarceration (ever and past 6 months), and current housing status (stable in a house or apartment vs unstable in a single-room-occupancy hotel, on the streets, in parks, in parked cars, in shelters, or temporarily staying with others).

We ascertained the number of lifetime sex partners and the prevalence of unprotected (no condom used) anal and vaginal sex (insertive and receptive) with male, female, and transgender sex partners. The number, gender, and type of sex partners (main, casual, and exchange) in the past 6 months and the prevalence of unprotected anal and vaginal sex by partner type also were documented. An exchange partner was defined as "a person you had sex with in exchange for things you needed or they needed such as money, drugs, shelter, or food." All reported sexual behaviors were defined so as to exclude the use of dildos and "sex toys."

We measured the prevalence of lifetime and recent (past 6 months) use of marijuana, cocaine, crack cocaine, amyl nitrite, heroin, hallucinogens, methamphetamine, and nonhormonal injection drugs. Among nonhormonal injection drug users, we determined the prevalence of sharing syringes, using cookers, and backloading (using 1 syringe to mix drugs and load another syringe).

Measures of physical and mental health included emergency department and outpatient medical visits in the past 6 months (dichotomized as none vs ≥1 visit), recent hormone use and injection, hormone syringe sharing, and source of hormones and syringes. We also measured history of mental health hospitalization, suicide attempts, HIV testing, and use of HIV-related health care. The 20-item Center for Epidemiologic Studies Depression Scale was used to screen for depression.[24] This scale has high sensitivity and specificity for major depression among primary care patients[25]; we used the standard cutoff score (≥16) to classify depression.[26]

HIV testing was performed with the OraSure HIV-1 Oral Specimen Collection Device (Epitope, Inc, Beaverton, Ore). Specimens were screened with the Vironostika HIV-1 Microelisa System Kit (Organon Teknika Corp, Durham, NC). Specimens that repeatedly tested reactive to enzyme-linked immunosorbent assay (ELISA) were confirmed with OraSure HIV-1 Western Blot Kits (Epitope, Inc, Beaverton, Ore). With confirmation, the OraSure test has high sensitivity and specificity.[27]

Statistical Methods

The χ^2 or the Fisher exact test was used to determine differences in proportions; median tests were used to assess differences in continuous variables. Unadjusted smoothing techniques (spline and loess) were used to determine whether age and lifetime number of partners had a linear relation to HIV prevalence among male-to-female transgender persons. An inverse U-shaped curve between age and HIV existed; cutpoints for age categories (18–29, 30–39, ≥40) were chosen to preserve this relationship.[28] We created a dichotomous variable for number of partners based on smoothing techniques that indicated a nonlinear relation with HIV and a clear cutpoint (>200 partners).

To identify factors independently associated with HIV prevalence among male-to-female transgender persons, we entered lifetime demographic and risk factors significantly associated with HIV in the bivariate analyses ($P<.05$) into a multiple logistic regression model as simultaneous entries. Crack, cocaine, and methamphetamine use were excluded from the multivariate model because of collinearity with one another and with injection drug use (Pearson $r \geq 0.40$).

Review of the correlation matrix of the multivariate parameter estimates identified no serious multicollinearity. Deviance and Pearson residuals from the logistic model were calculated and plotted; more than 99% of the deviance and more than 95% of the Pearson residuals were between –2 and 2, indicating good model fit.[29,30] Two-way interactions among modeled variables were assessed, but none were significant ($P \leq .20$).

Factors associated with HIV were not assessed for female-to-male transgender persons because few were HIV positive. All analyses were conducted with SAS, Version 6.0 (SAS Institute, Inc, Cary, NC); S-Plus, Version 4.5 Professional (Insightful Corp, Seattle, Wash), was used to graph the relationship between age and lifetime number of partners with HIV. All *P* values were 2-sided.

Results

Participation

We screened 645 individuals, of whom 586 (91%) were eligible for inclusion in the study. Of the eligible participants, 523 (89%) completed the interview and HIV test. No demographic differences were found between eligible subjects who did and did not complete the interview. Eight intersexed individuals (born with ambiguous or both male and female genitalia) were excluded from this analysis, because they could not be classified as male-to-female or female-to-male persons. The final sample comprised 392 male-to-female and 123 female-to-male transgender individuals.

The most common (non–mutually exclusive) ways that participants were recruited for the study were respondent-driven sampling (39%), outreach by study staff (38%), flyer recruitment (14%), and referrals from agencies (10%). Male-to-female transgender persons were more likely to report respondent-driven sampling recruitment (42% vs 32%, $P=.04$), and female-to-male transgender persons were more likely to be recruited by interviewers (58% vs 32%, $P<.001$). There were no other differences in demographics or HIV prevalence by recruitment type. Seventy percent of the participants returned for their HIV test results.

Sociodemographics

Most male-to-female and female-to-male participants self-identified as transgender, the

TABLE 1—Demographics of Male-to-Female and Female-to-Male Transgender Persons: San Francisco, Calif, 1997

	Male-to-Female (n=392), No. (%)	Female-to-Male (n=123), No. (%)	P^a
Gender identity			
Transgender	145 (37)	46 (37)	.09
Female	135 (34)	. . .	
Male	. . .	41 (33)	
Transsexual	100 (26)	26 (21)	
Other[b]	12 (3)	10 (8)	
Race/ethnicity[c]			
African American	104 (27)	12 (10)	<.001
Latina/Latino	106 (27)	14 (11)	
White	106 (27)	82 (67)	
Asian and Pacific Islander	49 (13)	9 (7)	
Native American	24 (6)	5 (4)	
Median age, y (range)	34 (18–67)	36 (19–61)	.25
Sexual orientation[c]			
Heterosexual	271 (69)	43 (35)	<.001
Bisexual	82 (21)	40 (33)	
Lesbian/gay	21 (5)	15 (12)	
Homosexual/gay	15 (4)	22 (18)	
Education			
<High school diploma	113 (29)	5 (4)	<.001
≥High school diploma	278 (71)	118 (96)	
Median monthly income, $ (range)[c]	744 (55–7346)	1100 (100–6000)	<.001
Current housing status[d]			
Stable	207 (53)	96 (78)	<.001
Unstable	185 (47)	26 (21)	
Incarceration, ever	255 (65)	36 (29)	<.001
Incarceration, past 6 mo	119 (30)	6 (5)	<.001
HIV positive (OraSure test result)	137 (35)	2 (2)	<.001

[a]Associations between characteristics and gender (male-to-female vs female-to-male) assessed with χ^2 test, Fisher exact test (for HIV prevalence), and the median test (for income and age).
[b]Includes transvestite, cross-dresser, bigender.
[c]Missing data: race/ethnicity (4), sexual orientation (6), income (16).
[d]Stable housing = owns or rents home or apartment. Unstable housing = single-room-occupancy hotel; living on the streets, in parks, in parked cars, or in shelters; or temporarily staying with others.

opposite gender of that at birth, or transsexual (Table 1). The median age of male-to-female and female-to-male participants was similar, but the 2 populations differed significantly on all other sociodemographic characteristics. Seventy-three percent of the male-to-female persons identified as non-White, whereas two thirds of the female-to-male persons identified as White. Male-to-female transgender individuals were more likely than female-to-male transgender individuals to identify as heterosexual, to report prior incarceration, and to have unstable housing, low education, and low monthly income. The most common ways (non–mutually exclusive) that male-to-female transgender individuals obtained money in the past 6 months included part- or full-time employment (40%), sex work (32%), Supplemental Security Income and Social Security Disability Insurance (29%), and General Assistance (23%), whereas 81% of the female-to-male were employed (not shown in table).

HIV Risk Among Male-to-Female Participants

Thirty-five percent of the male-to-female participants (n=137) had positive HIV test results, of whom 65% (n=89) knew they were infected, 20% (n=27) learned their status through study participation, and 15% (n=21) did not know their status and failed to return for test results. Fifty-two percent (n=11) of the participants who were HIV positive but did not obtain test results thought that it was "unlikely" or "there was no chance" that they were HIV infected. Only 50% of all the male-to-female individuals who were HIV infected were receiving HIV-related medical care. Of the persons who knew they were infected, 78% (n=69) were receiving HIV-related medical care, and 58% (n=52) were receiving HIV antiretroviral or prophylactic therapy.

Lifetime risk factors associated with HIV were common (Table 2). After control for other covariates, African American race was found to be the strongest risk factor for HIV infection (63% of the African American male-to-female participants were HIV positive). Other factors independently associated with HIV prevalence included having less than a high school degree, having had more than 200 lifetime sexual partners, and using nonhormonal injection drugs.

We compared recent risk behaviors of the male-to-female participants who were HIV infected and uninfected (Table 3). About one fifth of the male-to-female participants reported nonhormonal injection drug use in the past 6 months; this behavior was more prevalent among individuals who were HIV positive. Almost half of the injectors shared syringes and backloaded, and 29% shared cookers. Syringes were typically obtained from needle exchange sites (54%; n=39), the streets (22%; n=16), pharmacies or clinics (15%; n=11), and friends (8%; n=6).

Eighty percent of the male-to-female participants had had anal, vaginal, or oral sex in the past 6 months, and 37% had had more than 10 sex partners (Table 3). Three fourths of the male-to-female participants had had sex with males, 6% with females, and 8% with other transgender persons. Participants were more likely to engage in receptive anal sex (with male or transgender persons) than insertive anal sex (with male, female, or transgender persons) (63% vs 30%, $P<.001$). As shown in Table 3, unprotected receptive anal sex was more common with main partners, followed by casual and exchange partners. Participants who were HIV positive were more likely than uninfected participants to report receptive anal sex with main partners; no other differences were seen between the 2 groups in sexual behaviors or condom use. Only 7% of the male-to-female transgender persons had had vaginal construction surgery, so unprotected receptive vaginal sex with male or transgender persons was rarely reported (2%). Two male-to-female transgender persons reported unprotected insertive vaginal sex with a female.

HIV Risk Among Female-to-Male Participants

Two female-to-male participants (2%) had positive HIV test results; both knew their status and were receiving HIV-related health care. A history of nonhormonal injection drug use was reported by 18% of the female-to-male participants; 54% had injected hormones. Female-to-male participants reported a median of 27 lifetime sex partners. Twenty-seven percent reported unprotected receptive anal sex with a male, whereas 6% had engaged in unprotected receptive anal sex with a transgender person. Sixty-three percent reported unprotected receptive vaginal sex with a male; 25% had engaged in this behavior with a transgender person. Almost one third (31%) of the female-to-male participants had a history of sex

TABLE 2—Factors Associated With HIV Prevalence Among Male-to-Female Transgender Persons: San Francisco, Calif, 1997

	All Male-to-Female (n=392), No. (%)	HIV+ (n=137), No. (%)	Adjusted OR (95% CI)[a] (n=381)	*P*
Race/ethnicity				
White	106 (27)	23 (17)	Reference	
African American	104 (27)	65 (47)	5.81 (2.82, 11.96)	<.001
Latina/Latino	106 (27)	31 (23)	0.80 (0.37, 1.72)	.56
Other[b]	73 (19)	18 (13)	1.10 (0.49, 2.48)	.81
Age, y				
18–29	133 (34)	35 (26)	Reference	
30–39	149 (38)	65 (47)	1.71 (0.95, 3.07)	.07
≥40	110 (28)	37 (27)	0.93 (0.47, 1.84)	.83
Education				
≥High school diploma	278 (71)	86 (63)	Reference	
<High school diploma	113 (29)	51 (37)	2.08 (1.17, 3.68)	.01
History of incarceration	255 (65)	108 (79)	1.12 (0.62, 2.03)	.71
Lifetime risk behaviors				
No. of sex partners[c]				
≤200	212 (54)	51 (37)	Reference	
>200	180 (46)	86 (63)	2.64 (1.50, 4.62)	<.001
Nonhormonal injection drug use	134 (34)	69 (50)	2.69 (1.56, 4.62)	<.001
Hormonal injection drug use	256 (65)	108 (79)	1.67 (0.94, 2.97)	.08
URAI with male	330 (84)	127 (93)	2.34 (0.95, 5.78)	.06
UIAI with male	213 (54)	94 (69)	1.38 (0.82, 2.35)	.23
Sex work or survival sex	312 (80)	124 (91)	0.82 (0.37, 1.82)	.62
Forced sex or rape	231 (59)	92 (67)	1.02 (0.59, 1.75)	.95

Note. OR = odds ratio; CI = confidence interval; URAI = unprotected receptive anal intercourse; UIAI = unprotected insertive anal intercourse.
[a]Factors associated with HIV ($P<.05$) in bivariate analyses were entered in multivariate model. Eleven subjects were deleted because of missing data.
[b]Includes Asian and Pacific Islanders (67%) and Native Americans (33%).
[c]Includes anal, vaginal, and oral intercourse.

TABLE 3—Recent Risk Behaviors of Male-to-Female Transgender Persons Who Were HIV Positive and HIV Negative: San Francisco, Calif, 1997

	All Male-to-Female (n=392), No. (%)	HIV+ (n=137), No. (%)	HIV– (n=255), No. (%)	*P*[a]
Injection drug use behaviors, past 6 mo				
Injected street drugs	72 (18)	40 (29)	32 (13)	<.001
Shared syringes[b]	34 (47)	17 (43)	17 (53)	.37
Backloaded[b]	35 (49)	18 (45)	17 (53)	.58
Shared cookers[b]	21 (29)	11 (28)	10 (31)	.95
Sexual behaviors, past 6 mo				
No. of sex partners[c]				
0	80 (20)	27 (20)	53 (21)	.10
1	69 (18)	24 (18)	45 (18)	
2–10	99 (25)	41 (30)	58 (23)	
>10	144 (37)	45 (33)	99 (39)	
RAI with main partner[d]	146 (37)	66 (48)	80 (31)	<.001
URAI[e]	90 (62)	36 (55)	54 (68)	.11
RAI with casual partner[d]	144 (37)	55 (40)	89 (35)	.30
URAI[e]	63 (44)	25 (45)	38 (43)	.75
RAI with exchange partner[d]	128 (33)	46 (34)	82 (32)	.78
URAI[e]	36 (28)	11 (24)	25 (30)	.43

[a]Associations between characteristics and HIV prevalence assessed with χ^2 test.
[b]Among those who injected drugs in the past 6 months.
[c]Includes anal, vaginal, and oral sex.
[d]RAI = receptive anal intercourse with male or transgender main, casual, or exchange partners, respectively.
[e]URAI = unprotected receptive anal intercourse among those who had RAI with male or transgender main, casual, or exchange partners, respectively.

work or survival sex, and 59% reported forced sex or rape.

Recent risk behaviors were uncommon among female-to-male participants overall. Only 5 female-to-male participants (4%) reported nonhormonal injection drug use in the past 6 months, although 4 of these 5 individuals shared syringes and cookers and backloaded. All female-to-male injectors obtained syringes off the streets or from friends. Twenty percent of the female-to-male participants had not had anal, vaginal, or oral sex in the past 6 months; 46% had 1 partner, 32% had 2 to 10 partners, and 2% had more than 10 partners. Fifty-eight percent of the female-to-male participants had sex with females, 18% with males, and 15% with transgender individuals. Fifty-nine percent had sex with main partners, 41% with casual partners, and 4% with exchange partners. Ten percent of the female-to-male participants had receptive vaginal sex with a male or transgender person, of whom 67% (n=8) did not always use condoms. Only 7% had receptive anal sex with a male or transgender person, but 56% (n=5) of this group used condoms inconsistently. Only 2% (n=2) of the female-to-male participants had had penis construction surgery, so insertive anal and vaginal sex was rare.

Health Care Use and Mental Health Status Among Male-to-Female and Female-to-Male Transgender Individuals

A large proportion of male-to-female and female-to-male participants lacked health insurance (Table 4). Among those insured, male-to-female participants relied on public insurance, whereas female-to-male participants were more likely to have private insurance. Most male-to-female and female-to-male participants received care at a clinic or doctor's office, and about one fifth had visited an emergency department in the past 6 months. Male-to-female participants had a higher prevalence of recent hormone use and were more likely to obtain hormones from a nonmedical source but were less likely to inject their hormones than were female-to-male participants. Most female-to-male (92%) and male-to-female (82%) hormone injectors obtained their syringes from a medical source; only 3 individuals reported sharing hormone syringes in the past 6 months.

Some type of sexual reassignment surgery (typically breast augmentation for male-to-female and reduction for female-to-male transgender individuals) was reported by 22% of the male-to-female participants and one third of the female-to-male participants. Most male-to-female (72%) and female-to-male (85%) participants planned to have some type of surgery in the future. Slightly fewer than one third of both

TABLE 4—Health Care Use and Mental Health Status of Male-to-Female and Female-to-Male Transgender Persons: San Francisco, Calif, 1997

	Male-to-Female (n = 392), No. (%)	Female-to-Male (n = 123), No. (%)	P^a
Health care use			
Health insurance, current			
None	202 (52)	51 (41)	<.001
Public	132 (34)	14 (11)	
Private	56 (14)	58 (47)	
Clinic or doctor visit, past 6 mo	306 (78)	102 (83)	.25
Emergency department visit, past 6 mo	98 (25)	22 (18)	.10
Hormone use, past 6 mo	288 (73)	65 (53)	<.001
Injected hormones, past 6 mo[b]	121 (42)	63 (97)	<.001
Source of hormones, past 6 mo[b]			
Medical provider	204 (71)	63 (97)	<.001
Streets, black market, friends	84 (29)	2 (3)	
Mental health status			
Mental health hospitalization, ever	87 (22)	24 (20)	.50
Suicide attempt, ever	127 (32)	39 (32)	.89
Depression: CES-D score ≥16[c]	242 (62)	68 (55)	.17

Note. CES-D = Center for Epidemiologic Studies Depression Scale.[24]
[a]Associations between characteristics and gender (male-to-female vs female-to-male) assessed with χ^2 test.
[b]Of those who used hormones in the past 6 months. Fisher exact test used.
[c]Seven missing values.

male-to-female and female-to-male participants had attempted suicide, and about one fifth of each group had been hospitalized for a mental health condition. Almost two thirds of the male-to-female and 55% of the female-to-male participants were classified as depressed (Table 4).

Discussion

To our knowledge, this is the largest quantitative study to describe HIV risk, health care use, and mental health status of male-to-female and female-to-male transgender individuals. Our data show the diversity that exists within the transgender community. For example, gender identification does not determine sexual orientation. Male-to-female study participants primarily had sex with the opposite gender (males) and self-identified as heterosexual, whereas female-to-male participants were more likely to have sex with other males and transgender individuals and self-identified as gay or bisexual. We also found major differences between male-to-female and female-to-male participants with respect to demographic and HIV risk characteristics. In particular, male-to-female transgender persons were more socioeconomically disadvantaged and had higher HIV prevalence.

Our estimate of HIV prevalence among male-to-female transgender persons is higher than estimates from studies with gay men and injection drug users of the same age in San Francisco.[31–34] Half of the male-to-female transgender persons who were HIV positive in our study were not receiving HIV-related health care, and many individuals who were HIV positive and did not return for their test results thought it unlikely that they were infected. These findings highlight the importance of counseling male-to-female transgender persons about HIV and the benefits of early intervention.

There is a particular need to intervene with African American male-to-female transgender persons, two thirds of whom had positive HIV test results in our study. Similar associations between African American ethnicity and higher HIV prevalence have been found among transgender persons in Atlanta[7] and among gay men (older and younger), injection drug users, and heterosexual men and women in San Francisco.[31,32,35–37] As with previous studies, socioeconomic and behavioral differences did not account for the disproportionate level of HIV infection among African Americans in our study.

We found high levels of current risk behaviors among both HIV-positive and HIV-negative male-to-female transgender persons. We do not know, however, whether transgender populations serve as a "bridge group" in the HIV epidemic, because we did not determine the sexual orientation and HIV status of participants' sex partners. As with past research, we found that male-to-female transgender persons were more likely to engage in receptive rather than insertive anal sex.[3,11,16] Some researchers have suggested that receptive anal sex is more common because hormone use makes it difficult to maintain an erection,[16] and playing the receptive role is viewed as more feminine.[3]

Inconsistent condom use during receptive anal sex was commonly reported, particularly with main partners. This finding is consistent with past research on male-to-female transgender persons[7,38] and calls for interventions that decrease barriers to condom use with main partners. Risk reduction interventions also are needed for female-to-male transgender persons who have sex with men, because condom use was infrequent.

According to qualitative research, many male-to-female transgender persons turn to sex work because they face severe employment discrimination[2–4,6]; this may account for the high number of sexual partners and prevalence of sex work among male-to-female transgender persons in our study. Street outreach and more intensive HIV prevention interventions, such as prevention case management, are urgently needed for sex workers and should include education, job training, and job placement. Given the high rate of incarceration among our participants, jails and prisons may be good settings for HIV prevention interventions for sex workers.

We found very low levels of HIV risk associated with hormone injection, probably because several clinics in San Francisco offer hormone therapy. However, nonhormonal injection drug use was associated with HIV, and the prevalence of sharing syringes among injectors was higher than that in studies with out-of-treatment injection drug users in San Francisco.[34,39,40] Public health providers need to ask transgender clients about hormonal and nonhormonal injection drug practices and refer them to harm reduction and treatment interventions. In addition, needle exchange programs should reach out to transgender populations and provide both hormone needles (22 g, 1½ in) and nonhormone needles (27 g, ⅝ in).

Our study confirms that many transgender persons enter the medical system in pursuit of hormones.[1,15,16] In addition to providing hormone therapy, health care providers should counsel and appropriately refer transgender clients who are in need of HIV, substance abuse, and mental health services. There is a particular need to assess the potential for depression and suicide and intervene appropriately.

The prevalence of suicide attempts among male-to-female and female-to-male transgender persons in our study was much higher than that found in US household probability samples and a population-based sample of adult men reporting same-sex partners.[41,42] This finding supports a previous study of male-to-female transgender persons in the Netherlands, which found that the number of suicides among male-to-female transgender persons was much higher than the expected mortality for the Dutch male

population.[43] Although we did not assess factors associated with suicide attempts, researchers have hypothesized that higher rates of attempted suicide among gay youths compared with heterosexual youths may partially be the result of increased discrimination and victimization[44–46]—tragically, common experiences for transgender individuals.[2–4,6]

The primary limitation of our research was the use of nonprobability sampling. Our findings may not generalize to other urban areas, and there may be threats to internal validity if certain sampling methods were more likely to recruit high-risk individuals. Most traditional random sampling approaches would not produce reliable samples, however, because the transgender population has strong privacy concerns and has never been counted, and because many transgender persons are marginally housed or homeless.

Our use of social mapping and targeted sampling helped ensure that important subpopulations were sampled. Respondent-driven sampling capitalizes on the ability of members of a hidden population to recruit their peers and reduces many biases associated with traditional snowball sampling.[23] Despite the use of such methods, female-to-male participants were difficult to recruit. Female-to-male transgender individuals were more likely to be recruited through personal contacts with study staff than through respondent-driven sampling. This may partially account for the demographic differences we observed between male-to-female and female-to-male participants but is unlikely to account for the large difference in HIV prevalence.

Despite these limitations, our data describe an important population in San Francisco with many needs. Similar studies in other US cities are needed to assess the role of transgender individuals in local HIV epidemics. Our ability to recruit this hard-to-reach population was likely the result of engaging in participatory research and hiring a diverse group of male-to-female and female-to-male transgender staff. Similar peer-based approaches could be used to provide culturally appropriate HIV, substance use, mental health, education, employment, and other social services for transgender persons. In addition, because transgender individuals access the health care system for hormone therapy, medical providers can provide an important link to needed services. □

Contributors

K. Clements-Nolle, R. Marx, and M. Katz conceived and designed the study. K. Clements-Nolle and R. Guzman implemented the study protocols and supervised data collection, coding, and entry. K. Clements-Nolle analyzed the study data. R. Marx and M. Katz assisted with data analysis and interpretation. K. Clements-Nolle conducted the literature review and prepared the initial draft of the manuscript. All authors contributed to the final manuscript.

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